

WE CLAIM:

1. A method for preparation of an anode for a solid oxide fuel cell comprising the steps of
mixing a porous matrix material with a yttria-stabilized-zirconia (YSZ) powder, forming a porous matrix material/powder mixture;
forming said porous matrix material/powder mixture into a porous YSZ layer;
calcining said porous YSZ layer; and
impregnating said porous YSZ layer with a Cu-containing salt solution.
2. A method in accordance with Claim 1, wherein said porous matrix material comprises a plurality of zircon fibers.
3. A method in accordance with Claim 1, wherein said porous matrix material/powder mixture is mixed with glycerol and applied to an anode side of a YSZ electrolyte, forming said porous YSZ layer on said anode side of YSZ electrolyte.
4. A method in accordance with Claim 1, wherein said porous matrix material/powder mixture is added to a tapecast and said tapecast is deposited onto an anode side of a YSZ electrolyte layer, forming said porous YSZ layer on said anode side of YSZ electrolyte.
5. A method in accordance with Claim 5, wherein a cathode is applied to a cathode side of said YSZ electrolyte layer after said calcining of said porous YSZ layer.
6. A method in accordance with Claim 1, wherein a metal content of said porous YSZ layer is at least about 35% by weight of said porous YSZ layer.
7. A method in accordance with Claim 1, wherein said impregnated porous YSZ layer is calcined.

8 9. A method in accordance with Claim 1, wherein said porous YSZ layer is impregnated with ceria.

9 10. A method in accordance with Claim 9, wherein said ceria constitutes in a range of about 5% to about 40% by weight of said porous YSZ layer.

10 11. A method for producing a solid oxide fuel cell comprising the steps of:

mixing a porous matrix material with a yttria-stabilized-zirconia (YSZ) powder, forming a porous matrix material/powder mixture;

mixing said porous matrix material/powder mixture with glycerol, forming a slurry;

applying said slurry to an anode-facing face of a dense YSZ electrolyte layer, forming a porous anode layer/electrolyte layer assembly;

calcining said porous anode layer/electrolyte layer assembly;

applying a cathode layer to a cathode-facing face of said electrolyte layer, forming a fuel cell assembly;

impregnating said porous anode layer with a Cu-containing salt solution; and calcining said impregnated porous anode layer.

11 12. A method in accordance with Claim 12, wherein a metal content of said calcined impregnated porous anode layer is at least about 35% by weight of said calcined impregnated porous anode layer.

12 13. A method in accordance with Claim 11, wherein said porous matrix material comprises a plurality of zircon fibers.

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~~18.~~ In a solid oxide fuel cell comprising an anode electrode, a cathode electrode and an electrolyte disposed between said anode electrode and said cathode electrode, the improvement comprising:

said anode electrode comprising a porous YSZ layer and one of a Cu metal and a Cu alloy.

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~~17.~~ A solid oxide fuel cell in accordance with Claim 15, wherein said anode electrode further comprises ceria.

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~~18.~~ A solid oxide fuel cell in accordance with Claim 15, wherein a metal content of said anode electrode is at least about 35% by weight of said porous YSZ layer.

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~~19.~~ A solid oxide fuel cell in accordance with Claim 17, wherein a ceria content of said anode electrode is in a range of about 5% to 40% by weight of said porous YSZ layer.

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~~20.~~ A method for generating electricity comprising the steps of:
introducing at least one of a hydrocarbon and a carbonaceous fuel directly into an anode side of a solid oxide fuel cell comprising an anode electrode comprising a porous YSZ layer and one of a Cu metal and a Cu alloy, a cathode electrode and an electrolyte disposed between said anode electrode and said cathode electrode;

introducing an oxidant into a cathode side of said solid oxide fuel cell; and
directly oxidizing said at least one of said hydrocarbon and said carbonaceous fuel in said solid oxide fuel cell, resulting in generation of electricity.

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~~21.~~ A method in accordance with Claim 20, wherein said hydrocarbon comprises at least two carbon atoms.

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23. A method in accordance with Claim 20, wherein said anode electrode further comprises ceria.

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~~24.~~ A method in accordance with Claim 20, wherein said carbonaceous fuel is an alcohol.

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